

CLAIMS

What is claimed is:

- 1 1. A polishing pad comprising a body comprising fibers embedded in a matrix polymer
2 formed by a reaction of polymer precursors, the fibers defining interstices, and said
3 precursors filling said interstices substantially completely before completion of said
4 reaction.
- 1 2. A polishing pad according to claim 1, wherein said pad further comprises a polishing
2 layer of free fibers, at least a portion of which have a segment thereof embedded in the
3 matrix polymer of said body.
- 1 3. A polishing pad according to claim 2, wherein said polishing layer of free fibers has
2 a thickness of about 2 mils or less.
- 1 4. A polishing pad according to claim 1, wherein said fibers comprise a fiber web
2 formed by a nonwoven technique, including needle-punching, hydroentangling, chemical
3 bonding, or air-through bonding, or by a woven technique, including weaving, knitting, or
4 felting.
- 1 5. A polishing pad according to claim 4, wherein said fiber web has a Durometer
2 hardness in the range of about 10 to about 90 Shore A.
- 1 6. A polishing pad according to claim 4, wherein said fiber web has a density in the
2 range of about 0.15 to about 0.9 g/cc.

- 1 7. A polishing pad according to claim 1, wherein the fibers are made of a polyester,
2 polypropylene, polyamide, rayon, polyimide, or polyphenylene, or a combination of said
3 fibers.
- 1 8. A polishing pad according to claim 1, wherein said polymer is a solid or a porous
2 polyurethane, polycarbonate, polymethylmethacrylate (PMMA) or epoxy.
- 1 9. A polishing pad according to claim 1, wherein after said reaction said pad has a
2 Durometer hardness in the range of about 50^{to} about 100 Shore D.
- 1 10. A polishing pad according to claim 1, wherein said polymer is a solid polyurethane.
- 1 11. A polishing pad according to claim 1, wherein, after said reaction, said pad
2 comprises about 20% to about 80% fibers by weight and about 80% to about 20% polymer
3 by weight.
- 1 12. A polishing pad according to claim 1, wherein, after said reaction, said pad has a
2 density in the range of about 0.5 to about 1.1 g/cc.
- 1 13. A polishing pad according to claim 1, wherein, after said reaction, said pad has a
2 thickness in the range of about 10 to about 130 mils.
- 1 14. A method of making a polishing pad comprising a body comprising fibers
2 embedded in a matrix polymer formed by a reaction of polymer precursors, said fibers
3 defining interstices, and said precursors filling said interstices substantially completely
4 before completion of said reaction, said method comprising placing said fibers and said
5 precursors in a cavity of a mold for shaping said pad; applying a differential pressure across
6 said mold cavity, said differential pressure and the amount of said precursors being

7 sufficient to cause said precursors to fill said interstices substantially completely before
8 completion of said reaction; and applying sufficient heat to said mold to at least partially
9 cure said pad by causing said precursors to react.

1 15. A method according to claim 14, further comprising removing said cured pad from
2 said mold cavity and buffing at least one side of said cured pad with an abrasive device for
3 fracturing and removing a portion of said polymer to form a polishing layer of free fibers, at
4 least a portion of said free fibers being embedded in unfractured matrix polymer of said
5 body adjacent to said polishing layer.

1 16. A method according to claim 15, wherein said polishing layer of free fibers has a
2 thickness of about 2 mils or less.

1 17. A method according to claim 14, wherein said fibers comprise a fiber web formed
2 by a nonwoven technique, including needle-punching, hydroentangling, chemical bonding,
3 or air-through bonding, or by a woven technique, including weaving, knitting, or felting.

1 18. A method according to claim 17, wherein said fiber web has an initial thickness of
2 about 50 mils to about 100 mils when placed in said mold cavity, and wherein said initial
3 thickness is reduced by about 10% to about 20% by said heat and pressure.

1 19. A method for polishing a surface comprising contacting the surface to be polished
2 with a polishing pad comprising a body comprising fibers embedded in a matrix polymer
3 formed by a reaction of polymer precursors, the fibers defining interstices, and said
4 precursors filling said interstices substantially completely before completion of said
5 reaction.

1 20. A method according to claim 19, wherein said polishing pad further comprises a
2 polishing layer of free fibers, at least a portion of which have a segment thereof embedded
3 in the matrix polymer of said body.

1 21. A method according to claim 20, wherein said polishing layer of free fibers has a
2 thickness of about 2 mils or less.

1 22. A method according to claim 19, wherein said fibers comprise a fiber web formed
2 by a nonwoven technique, including needle-punching, hydroentangling, chemical bonding,
3 or air-through bonding, or by a woven technique, including weaving, knitting, or felting.

1 23. A method according to claim 19, wherein the surface to be polished is Al, Al alloys,
2 Cu, Cu alloys, W, W alloys, silicon oxide, polysilicon, silicon nitride, Ta, Ta alloys, Ti, Ti
3 alloys, Au, Au alloys, or combinations thereof.

1 24. A method according to claim 19, wherein said polishing is chemical-mechanical
2 polishing (CMP).